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of Engineers

DCAF Bulletin

Design Construction Analysis Feedback

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Subject: **PREPARATORY INSPECTIONS**

Applicability: **Guidance**

Reference: CEGS-01440, Contractor Quality Control
EP 715-1-2, A Guide to Effective Contractor
Quality Control
ER 1180-1-6, Construction Quality Management

Observation: The referenced guide specification, engineer regulation, and engineer pamphlet address Corps of Engineers construction quality management procedures which include the three phase, or three step, control system. Results of recent HQUSACE design-construction evaluations (DCE) of district and field offices indicate our construction quality management personnel are not adequately assuring contractor compliance with the preparatory phase (PI) requirements of the three phase control system. In some field offices the PI has become more of a checklist function than actual control procedure. The quality of PI documentation is also declining.

Requirement: Guide specification CEGS-01440, Contractor Quality Control, includes a requirement that construction contractors establish a process for controlling construction quality. This process is termed the three phase control system, sometimes referred to as the three step inspection system, and includes preparatory, initial (I/I), and follow-up (FUP) control phases for each definable feature of work. Engineer pamphlet EP 715-1-2 provides additional guidance on the contractor quality control (CQC) system and addresses the three phase control system. Engineer regulation ER 1180-1-6 provides general policy and guidance for establishment of construction quality management procedures. When discussing both Corps of Engineers quality assurance (QA) and contractor CQC procedures the regulation addresses the three phase control system.

The CQC guide specification requires that the PI phase for each definable feature of work in a contract include the following:

a. A review of each paragraph of applicable specifications. This review is to include applicable environmental protection and any installation/locality specific requirements.

b. A review of the contract drawings.

c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. A review of the contractor's proposed control inspection and testing procedures.

e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with contract provisions.

f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

g. A review of the appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for controlling quality of the work including **repetitive deficiencies**.

i. A check to ensure that the portion of the CQC Plan for the work to be performed has been accepted by the resident engineer.

j. Discussion of the initial control phase.

k. The guide specification requires the contractor give the resident office advance notice of the PI. It requires the PI be conducted by the CQC system manager and be attended by the superintendent, other CQC personnel as applicable, and the **foreman** responsible for the definable feature of work. Results of the preparatory phase must be documented by separate minutes prepared by the CQC system manager and attached to the daily CQC report. Lastly, the specification states the contractor is required to instruct all applicable workers as to the acceptable level of workmanship necessary to meet contract requirements. Instruction to the workers is important to this control process.

Discussion: While each of the three phases of the control process is critical to construction quality management, the importance of the preparatory phase cannot be over emphasized. A properly conducted PI can eliminate the expense in time and money associated with tear out and replacement of work. When remedial work is necessary, costs to the contractor can be substantial. These costs may include reprocurement of materials or equipment for the rework; cost of temporary materials/equipment required to accomplish the rework, such as scaffolding, concrete formwork,

rolling stock, etc.; scheduling the contractor/subcontractor placement crews to perform the rework; rescheduling placement crews for follow-on work; cost of increased CQC effort, supervision, labor, etc. Tear out and replacement of work will add to the government's construction management costs for overseeing reprocurement of materials/equipment and tear out of defective work; participation in another PI and I/I for the phase of work; documentation of all aspects of the process, and; upward reporting if necessary. There is also an intangible cost to all parties involved when a major breakdown in the QA/CQC process occurs -- reduction in the customer's level of confidence that a quality product will be delivered safely, on time, and within the money.

Recent DCE visits indicate a significant number of construction deficiencies are directly attributable to poorly conducted PI's. Two common failures in the PI phase which result in defective work are failure to have all the right people participate in the PI and failure to perform a physical inspection of the materials and equipment required in the definable feature of work. When questioned why the PI's are not properly conducted, QA personnel commonly advise the DCE team that 1) the contractor was in a hurry to begin a phase of work and QA personnel didn't want to hold up progress by having a long, drawn out PI; 2) QA personnel were of the opinion the PI is the contractor's sole responsibility and it's not up to them to dictate procedure to the contractor, and; 3) QA personnel no longer have time to put a lot of effort into the PI phase, that they cannot do more with less. The remainder of this DCAF Bulletin will address the two most common failures in the PI process which were noted above.

Recommendation: CQC guide specification paragraph 3.6.1.k identifies the type of contractor representatives required to participate in the PI; for example, the CQC system manager, a CQC specialist for the discipline involved (such as a mechanical CQC representative for HVAC duct installation or an electrical CQC representative for motor control center installation), and the foreman responsible for the definable feature of work. As previously stated, it also requires the contractor instruct applicable workers as to the acceptable level of quality required. The requirement for the foreman to participate in the PI is crucial to getting the required level of construction quality. When the contractor will have a subcontractor perform a portion or all of a definable feature, it's imperative the subcontractor's foreman participate in the PI meeting. When possible, having the crew chief or lead placement personnel below the foreman level attend the more critical PI's will help assure success. The CQC system manager should advise the QA personnel how "all applicable workers" not participating in the PI will be instructed on the required level of quality.

Having the right QA personnel participate in the PI phase is also critical to achieving deficiency-free high quality construction.

When the contractor has identified the definable features of work during the QA/CQC coordination meeting, prior to start of construction, and submitted an accurate construction schedule identifying dates of the PI's, the resident engineer is better able to schedule QA personnel of the required disciplines to participate in each PI. This QA technical representation can include construction representatives, engineering technicians, area, resident, or project engineers, technical specialists from the district, and personnel from the Corps laboratories and technical centers of expertise (TCE). With advance planning, technical support can be obtained from sources outside the Corps. Architect-engineer and other Title II support can be made available to the resident engineer when the situation warrants. Advance planning is critical to optimizing the benefits of this technical support since anyone outside the field office will need to become familiar with contract plans, specifications, samples, submittals, construction schedule, job conditions, etc. before participating in a PI. Finally, QA representatives should assure that all attendees are identified by name, organization, and job title in the contractor's minutes of each PI phase.

Guide specification paragraph 3.6.1.f contains the requirement for physical examination of materials or equipment during the PI phase. This requirement is not being enforced on many of our projects. Again, the two most common reasons given by QA personnel for not enforcing this contract requirement include not wanting to hold up the contractor's progress if the materials or equipment are not onsite and not wanting to dictate how the contractor conducts the PI. Since the contract specifications spell out all CQC requirements, including the individual elements comprising the PI phase, neither of these two excuses are valid. From a logical standpoint it's much easier for both contractor and Corps personnel to deal with the matter of non-complying materials or equipment at the time of the PI, before they're incorporated in the permanent work and especially before they're built upon by further work. Once work is in-place, or in-place and built upon, remedies for its removal and replacement become more involved. At that late stage there will most likely be strong resistance on the contractor's part to remove and replace defective work at his or her own expense.

Construction quality will improve when specified requirements for each phase of the three phase control system, particularly the preparatory phase, are reviewed and discussed in greater detail by Corps of Engineers and contractor personnel during the QA/CQC coordination meeting prior to commencement of work.



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